DOCUMENT RESUME

ED 229 126 PS 013 481

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TITLE Children's Concept Learning: The Child's Concept of Life.
PUB DATE Apr 83
NOTE 13p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (Detroit, MI, April 21-24, 1983).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Children; *Concept Formation; Elementary Education; *Research Methodology; *Research Problems
IDENTIFIERS Piagetian Theory

ABSTRACT

To explore controversial findings concerning some of Piaget's claims, four experiments investigated conditions under which children use a criterion of movement in attributing life to objects. In the first experiment, children ages 4 through 7 participated in a recognition task involving the identification of objects to which they attributed life. Children's judgments were classified according to rules they appeared to use. In the second experiment, children ages 4 through 11 were asked to name as many living things as they could in 5 minutes, up to a maximum of 24. Results of the two experiments provided no evidence that children routinely identify life by observing motion. With children of 4 through 11 years of age, a third experiment explored the discrepancy between these results and previous studies by further investigating children's judgments and their explanations. It was found that one-fourth of the explanations of the youngest children referred to motion and that the use of explanations involving motion decreased with age. This result may account for Piaget's suggestion that young children identify life by observing motion. A fourth experiment investigated whether an emphasis on objects' motion states could influence children's judgments of whether an object was living or nonliving. It was found that whereas emphasis on objects' motion states had little effect on the judgments of 6- to 9-year-old children, the majority of 4- and 5-year-olds did use a rule based on the current motion state of each object. (RH)

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Children's Concept Learning: The Child's Concept of Life

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PS013481

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Children's Concept Learning: The Child's Concept of Life

In 1929, Piaget suggested that all children, prior to attributing life to plants and animals, identify life first with function, then with motion, and then with autonomous motion. Replications of Piaget's work have created more conflict than confluence, however. Some investigators (e.g., Russell(1940)) have supported Piaget's claims completely, while others (e.g., Laurendeau and Pinard, (1962)) have agreed with only some of his claims. Still other investigators have found little support for any of Piaget's claims (Klingensmith (1953), Klingberg (1957), Huang and Lee 1945).

These replicators of Piaget's work have also disputed his claims that young children report non-living things as alive because they identify life with motion. Huang and Lee (1945) and Klingberg (1957) have suggested that children are occasionally misled by salient characteristics of some objects. Klingensmith (1953) suggested that children were using "alive" metaphorically rather than literally. Laurendeau and Pinard suggested that children identify life with various anthropomorphic traits, including movement along with many others.

Variations in the type of data emphasized by these investigators, their scoring criteria, and their choice of stimuli may explain many of the differences in their findings. Huang and Lee (1945), Klingberg (1957) and Klingensmith (1953) based their reports on children's judgments, whereas Piaget (1973), Russell (1940), and Laurendeau and Pinard (1963) focussed primarily on children's justifications for their judgments. The former three investigators also adopted a somewhat more liberal scoring system than the latter three, concluding that children understood the concept of life if the bulk of their answers were correct. Finally, the former three investigators

included only one or no extraterrestrial bodies and natural forces in their stimuli, while the latter group utilized between two and five of them.

Experiment 1

In the present study, an attempt was made to establish the conditions under which children identify life with movement, by varying task requirements within a common procedural framework. In Experiment 1 a simple recognition task was used to determine to what children of different ages attribute life. Four rules were tested. Rule I: Things that have an inherent capacity for motion are alive. Rule II: Things that are moving are alive. Rule III: People and other animals are alive. Rule IV: People, other animals, trees, and other plants are alive. Children ranging from 4 through 7 were shown 60 pictures of people, animals, trees, plants, vehicles, and other objects, either moving themselves, being moved, or sitting still. They were told a one-sentence story about each object and then asked if it was alive or not. Performance on the problems was used to indicate which rule, if any, the children were using to judge life status.

The results of Experiment 1 indicated that most children believe either people and animals, or people, animals, plants, and trees are alive (Table 1). Only one 4-year-old attributed life to moving things; the other 31 children would be classified at Piaget's Stage IV.

Experiment 2

It is possible that children do believe some objects besides animals and plants are alive, but that we did not include these objects in Experiment 1. In Experiment 2, children ranging from 4 through 11 were asked to name as many living things as they could in 5 minutes, up to a maximum of 24. The probability that each child would produce a particular answer should be highest for the objects most strongly associated with life.

Less than 1% of the children's answers consisted of objects other than living things and the consituents of living things. Number of children mentioning at least one tree (Table 2) increased with age, as did the number mentioning at least one other plant, and the number mentioning at least one part of a living thing ($F(4,75)=10.88$, 14.20, and 3.17, respectively).

Thus, the results of Experiments 1 and 2 provided no evidence that children routinely identify life with motion. Rather, younger children tended to report people and other animals as alive, while older children also reported trees and other plants.

Experiment 3

One possible explanation for the descrepancy between the present results and those of other investigators was that these results are based solely on children's actual judgments of the presence of life, whereas other investigators have relied heavily on children's explanations, as well. Children's judgments might not coincide with their explanations because they are not aware of the basis for their answers, or because they do not consider the basis for their answers to constitute a suitable justification.

In Experiment 3 this hypothesis was tested. Children ranging from 4 through 11 were asked if each of 28 objects, including people, animals, plants, trees, moving objects, still objects, and autonomously moving objects, was alive. Following each of their answers, the children were asked, "Why?" or "Why not?" As before, the children's judgments were classified according to the rules they appeared to be using. The children's justifications were grouped into categories by 2 independent raters.

Judgments. The number of children in each age group found to be using each rule is listed in Table 3. Most children reported that people, animals, plants, and trees were alive or that only people and animals were alive. The

number of children using the former rule increase with age, while the number using the latter decreased with age ($\chi^2(3)=9.34$, $\chi^2(3)=10.53$, respectively).

Among the 16 children who did not meet any rule usage criteria, 10 reported that people, animals, plants, and trees were alive, and also that 2, 3, or 4 of the autonomously moving objects were. This response pattern could not be considered an identification between autonomous motion and life, however, as these children also reported that plants and trees were alive.

Explanations. The percentage of explanations provided by the children in each category are listed in Table 4. One-fourth of the explanations of the youngest children referred to motion, and the use of motion explanations decreased with age. This result supports the argument that Piaget's reliance on justifications led him to suggest that young children identified motion and life. However, requiring the child to justify his answers did not by itself appear to increase the number of motion rule users. Most of the children attributed life to people and animals, or people, animals, plants, and trees. Only one child used a motion rule.

What other factors might account for the fact that some investigators report an identity between life and motion, while others do not? It is possible that some of the procedures used to assess children's knowledge may have emphasized the motion states of the objects, while others did not do so. This possibility was examined in Experiment 4.

Experiment 4

Let us attempt to put ourselves in the position of the child for a moment. Being asked to judge whether an object is alive or not and then justify your answer may constitute an ambiguous situation. Suppose you were asked if a dog was alive, and why. Answering that a dog is alive because it is a dog might not seem to be the type of answer that an adult would like to

hear. Thus, you might be lead to submit a number of different justifications for your judgment, and rely on subtle signs of the experimenter's hopes or preferences to guide you.

Experiment 4 was designed to investigate whether an emphasis on objects' motion states could influence children's judgments. Children ranging from 4 through 9 were given the same 60 stimuli used in Experiment 1. This time, however, a tag phrase was added to each story emphasizing the motion state of the object.

As can be seen in Table 5, emphasis on the motion states of the objects had little effect on the judgments of the 6- to 9-year-olds. As with the children in Experiment 1, these children reported that people and animals, or people, animals, plants, and trees were alive. However, the majority of 4- and 5-year-olds used a rule based on the current motion state of each object. These children used motion rules significantly more often than either of the two older age groups ($\chi^2(1)=11.79$, $p<.01$ in both cases), and significantly more often than the 4- and 5-year-olds in Experiment 1 ($\chi^2(1)=8.86$, $p<.01$).

Discussion

The results of the four experiments reported above make it possible to suggest some conditions under which children will and will not identify life with motion. Under most conditions, children ranging from 4 through 11 did not judge moving or self-moving things to be alive. Rather, they judged people and animals, or people, animals, plants and trees to be alive (Exps. 1 and 3), and they produced only people, animals, plants, trees, and parts of living things as examples of things that are alive (Exp. 2). The dominant developmental trend was the extension of life to plants and trees in addition to people and other animals. In all four experiments the number of children

attributing life to plants and trees increased substantially between the ages of 4 and 8. As the animal and plant kingdoms differ on just about every dimension of morphology and behavior except those relating to life processes, it is not particulaly surprising that very young children are reluctant to group them together.

Methodological factors appeared to play a strong role in the experimental results obtained. Reliance on explanations as well as judgments suggests a closer relationship between motion and life than reliance on judgments alone. Inclusion of several extrateresstrial objects and natural forces also may lead the experimenter to a closer relationship between motion and life than if only one or none of these objects were included. Finally, investigators who reported a close link between life and motion also used scoring systems in which even one attribution of life to an inanimate object was considered sufficient evidence the chid did not understand the concept. Investigators who reported that even young children understood the concept tended to adopt a more lenient criterion. As Experiment 3 indicated, even 8- and 9-year-olds often attributed life to one or two extraterrestrial objects and natural forces, although the bulk of the answers of even the 4-year-olds were accurate.

The effects of experimenter emphasis on qualities such as motion is difficult to assess. Preschoolers in Experiment 4 responded to an emphasis on motion by using motion to judge life status, although older children appeared unaffected. It is not presently clear whether young children's judgments would be equally affected by emphasis on any life-related trait, or whether this influence is confined only to motion.

In conclusion, it appears that even 4- and 5-year-olds are aware that people and animals are alive and that inanimate objects are not. By the time

children reach the age of 8, the bulk of them also realize that plants and trees are alive. However, even 8- and 9-year-olds sometimes report the sun, the moon, lightning, and the wind are alive. Young children often judge life in terms of motion when motion is emphasized in the question, and children of all ages frequently explain the judgments of life in terms of motion. The results demonstrate that varying task conditions within a common procedural framework can aid us in identifying when children demonstrate particular aspects of their conceptual understanding.

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TABLE 1: NUMBER OF CHILDREN USING EACH RULE IN EACH AGE GROUP (Exp. 1)

	RULE USED				
AGE GROUP	Rule I	Rule II	Rule III	Rule IV	No Rule
4- and 5-Year-Olds	0	1	12	3	0
6- and 7-Year-Olds	0	0	8	8	0

TABLE 2: NUMBER OF INDIVIDUALS IN EACH AGE GROUP MENTIONING AT LEAST ONE MEMBER OF EACH CATEGORY

	CATEGORY					
AGE GROUP	People	Animals	Trees	Plants	Parts of Living Things	Inanimate Objects
4- and 5-Year-Olds	12	16	1	2	0	2
6- and 7-Year-Olds	12	16	4	4	0	1
8- and 9-Year-Olds	14	16	14	13	3	0
10- and 11-Year-Olds	15	16	7	15	5	1
Adults	16	16	12	12	5	2

TABLE 3: NUMBER OF CHILDREN USING EACH RULE IN EACH AGE GROUP (Exp. 3)

AGE GROUP	Rule I	Rule II'	Rule III	Rule IV	No Rule
4- and 5-Year-Olds	0	0	8	4	4
6- and 7-Year-Olds	0	0	5	6	5
8- and 9-Year-Olds	1	0	2	8	5
10- and 11-Year-Olds	0	0	1	13	2

TABLE 4: PERCENTAGE OF EXPLANATIONS GIVEN BY EACH AGE GROUP

	Age Group			
Answer Categories	4-5	6-7	8-9	10-11
Formal Class Membership	6%	17%	19%	21%
Motion	24%	16%	13%	10%
Essential Qualities of Animals and Plants	19%	20%	25%	38%
Non-Essential Qualities of Animals and Plants	27%	13%	16%	13%
Traits of Non-Living Things	14%	23%	23%	17%
Other Answers	1%	8%	3%	1%
I Don't Know	9%	3%	1%	0%

TABLE 5: NUMBER OF CHILDREN USING EACH RULE IN EACH AGE GROUP (EXP. 4)

	RULE USED				
AGE GROUP	Rule I	Rule II	Rule III	Rule IV	No Rule
4- and 5-Year-Olds	0	10	3	1	2
6- and 7-Year-Olds	0	0	9	7	0
8- and 9-Year-Olds	0	0	0	16	0